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CATALOG
AC 1003 010 00

405 130

TM 1003 010 00

Milestone 11

160A Computer Program Description

TECHNICAL MEMORANDUM

(TM Series)

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Systems Division Program, for Space Systems Division, AFSC.

| | |
|-----------------------------------|--------------------|
| Milestone 11 | SYSTEM |
| 16QA Computer Program Description | DEVELOPMENT |
| By | CORPORATION |
| V. J. Gergen | 2500 COLORADO AVE. |
| 26 March 1963 | SANTA MONICA |
| Approved | CALIFORNIA |
| R. D. Knight | |

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26 March 1963

-1-

TM-1003/010/00

PROGRAM IDENTIFICATION

A. Title: CCC Simulator Program (CCC SIM) - Ident 22C, Mod 00

B. Programmed: 11 January 1963

N. D. Babic, Control Data Corporation

C. Documented: 26 March 1963

N. D. Babic, CDC and V. J. Gergen, SDC

PURPOSE

The CCC Simulator provides a simulated intercommunication link between the Bird Buffer (BB) computer and the Tracking Station (TS) computer that is normally performed by the Computer Communication Converter (CCC) and associated equipment.

USAGE

A. Operating Instructions

- Step 1 Master Clear all three computers before uncabling and recabling.
- Step 2 Use machine load of computer No. 1 to read the paper tape containing the CCC Simulation program into core. Starting location is "0000" Bank "0".
- Step 3 Set Selective Stop Switches 1 and 2 (SLS 1 & SLS 2) on the CCC Simulation computer for error stop indications desired. (See Error Stops below.)
- Step 4 Load interfacing programs into TS & BB computers and put them into the programmed "wait loop" (see Restrictions D, Computer No. 2 = TS, Computer No. 3 = BB).
- Step 5 Set the CCC Simulation computer Program Register (P) = 0000, and set Run/Step switch to "RUN".
- Step 6 Execute a Manual Interrupt on the CCC Simulation computer, e.g., depress a Jump and a Stop key, simultaneously, to start programs into the transmission cycle.

B. Error Stops:

P = 1270: A tracking station computer has failed to take the status code word, if SLS 1 is set.

- P = 1273 A tracking station computer has failed to take the data word, if SLS 2 is set.
- P = 0414 A tracking station computer has attempted to send or receive out of turn.
- P = 1567 A Bird Buffer computer has failed to take a status code work, if SLS 1 is set.
- P = 1572 A Bird Buffer computer has failed to take a data word, if SLS 2 is set.
- P = 0114 A Bird Buffer computer has attempted to send or receive out of turn.

C. I/O Format

1. Inputs

Select Codes - The following select codes can be issued by the BB and TS computers. These select codes will be interpreted by the CCC Simulator program as indicated below:

| EFC | ACTION |
|-------------------|--|
| 5500 | Transfer a word from the CCC Simulator to the BB (or TS) computer. |
| 5501 | Transfer a word from the BB (or TS) computer to the CCC Simulator for relay to TS ₁ (or BB ₁) computer. |
| 5502 | Transfer a word from BB (or TS) computer to the CCC Simulator for relay to TS ₂ (or BB ₂) computer. |
| 5503 | The BB (or TS) requests the present status of the CCC Simulator. |
| 5504 through 5511 | No action required of CCC Simulator. |

Data Words - The input data word uses the standard 12 bit computer word.

Interrupt 10 - Interrupt 10 is a one time input, when the operator wishes to start the transmission cycles between the computers.

26 March 1963

-3-

TM-1003/010/00

- Interrupt 20 - Interrupt 20 is programmed internal to the CCC Simulator. It indicates when the TS computer has an input word for the CCC Simulator on the Internal Buffer channel.
- Interrupt 30 - Interrupt 30 is programmed internal to the CCC Simulator. It indicates when the BB computer has an input word for the CCC Simulator on the External Buffer channel.
- Interrupt 40 - Interrupt 40 is generated by the CCC adaptor to indicate to the CCC Simulator that the BB computer has requested status from the CCC Simulator. The input is via the CCC Simulator computer's Normal channel.

2. Outputs

CCC Status Words - The CCC Simulation computer outputs a 12 bit status word when requested by the BB or TS computer. The following is the bit interpretation of the Status Code word:

| Bit No. (from left to right) | Interpretation |
|---------------------------------|--|
| 2^0 | CCC Simulator has a valid input word for the BB (or TS) computer. |
| 2^2 | CCC Simulator is ready to receive a word from the BB (or TS) computer. |
| 2^8 | The source of the input word is from the remote number one computer. |
| 2^9 | The source of the input word is from the remote number two computer. |

The remaining bits are unused and are set to zero.

Interrupt 40 - The Interrupt 40 is generated as a timed output and alternately transmitted to the BB and TS computers.

Data Word - The data word is transferred as the standard 12 bit computer word.

METHOD

A. General

The CCC simulation program, in a single 160-A computer, assumes the role of two CCC's, the interstation communication equipment, and their associated telephone lines. It provides a method for apparent multiplexing of data as a sending device, and separating and distributing the data to the appropriate computer as a receiving device. It is capable of interfacing with programs, in other 160-A computer, which are programmed such that their 160-A normal channel appears as two computers. The simulation program performs the following functions of the CCC.

1. Within each transmission word time of 13.3 milliseconds, it selects the simulator adaptor to interrupt each apparent computer in the link if a data word directed to that computer is available. The receiving computer is allowed approximately 1.8 milliseconds to service the interrupt and select the word.
2. Within each 13.3 milliseconds interval, it selects the simulator adaptor to interrupt each apparent computer in the link, subject to the priority of 3. whose interrupt is enabled to allow that computer to send a word of data. It maintains a status by means of select codes from the individual computers.
3. It controls the interrupt procedure of 2. such that each apparent 160-A is allowed to send data on a word-by-word priority basis, where the lowest priority is assigned to the computer that sent last.
4. It provides unique sets of status codes to each of the apparent interfacing 160-A computers.

B. Specific

The CCC Simulator program cycles through the following steps.

1. Signal the target computer with an Interrupt 40.
2. Wait for the target computer to issue a request for the CCC Simulator status (EFC 5503). This activates the Interrupt 20 or 30 line. The receipt of this interrupt at this time in the quarter cycle indicates to the CCC Simulator that the target computer has requested status.
3. Reactivate the appropriate output buffer with the status code as a data word.

4. Reactivate the appropriate input buffer for the EFC word, and wait for a 20 or 30 Interrupt. The interrupt at this point in the quarter cycle indicates that the target computer has transmitted the EFC to the CCC Simulator as indicated by the status word to the BB (or TS) computer.

5. Execute the appropriate subroutine.

For EFC 5500:

- a. Reactivate the output buffer with the data word.
- b. Reactivate the input buffer controls.
- c. Wait for an interrupt 20 or 30. Return to 1. if the quarter cycle time runs out. Return to 5. if the interrupt arrives.

For EFC 5501 or 5502:

- a. Reactivate the input buffer and wait for the Interrupt 20 or 30.
- b. After receipt of the interrupt again reactivate the input buffer.
- c. Wait for an interrupt 20 or 30. Return to 1. if the quarter cycle time runs out. Return to 5. if the interrupts arrives.

RESTRICTIONS

- A. The target computer must service the Interrupt 40 in the time allotted (approximately 1.8 milliseconds for the BB and 1.85 milliseconds for the TS). Failure to service the interrupt in time will cause the CCC Simulator program to HALT (See Error Stops, page No. 1).
- B. No other external device can be operated on the normal channel of the TS computer.
- C. The CCC Simulator program is designed to ignore the following EFC's:

| <u>EFC</u> | <u>FUNCTION</u> | <u>EFC</u> | <u>FUNCTION</u> |
|------------|----------------------------|------------|-------------------|
| 5504 | Disable Transmit Interrupt | 5508 | Not Used |
| 5505 | Initiate Resign | 5509 | Not Used |
| 5506 | Enable transmit Interrupt | 5510 | Enable Test Mode |
| 5507 | Not Used | 5511 | Disable Test Mode |

- D. The interfacing TS and EB programs should be programmed with a "Wait" loop as a starting point to allow the CCC Simulator program to start the cycling routine.

E. CPDC System Configuration

The CCC Simulation System is composed of three 160A's: 160A 1 = the CCC Simulator Computer, 160A 2 = the Remote Tracking Station Simulator, and 160A 3 = Bird Buffer Computer; two 169 auxiliary memories; 169 2 is associated with 160A 3, and 169 1 is associated with 160A 1 and the Simulator Adaptor; and various peripheral devices as needed by the EB & TS programs.

The system layout is shown in Figure 1. Note that the Normal Channel of 160A 2 computer is connected to the Internal Buffer Channel of 160A 1, while the 160A 3 computer's Normal Channel is connected to the External Buffer Channel of 160A 1 computer. The Normal Channel of 160A 1 is used, via the CCC Simulator Adaptor, to provide interrupts to 160A's and No. 2 and No. 3.

F. Cabling Instructions for the CPDC Installation

The following cabling connections must be made in order to utilize the CCC Simulator:

1. Remove the cables in the 161 cabinet that jumper to the 1610 and connect to the cables that are marked with black tape, "IN" and "OUT", to the jacks marked "IN" and "OUT", respectively. These are the jacks from which the 1610 cables were removed.
2. Remove the cables from J02 and J04 of 169 1 and connect the cable with the black tag marked J04 to J04.
3. Attach connectors J01 thru J09 to CCC Simulator adaptor in 169 1.
4. Be sure the cables with the black tags marked J02 and J04 in 169 2 are connected to J02 and J04 jacks.
5. A cable diagram is given in Figure 2 which will indicate all other connections that are normal to the CPDC.

TIMING

The CCC Simulation cycle time for the 40 Interrupt is 13.3 milliseconds. Because the 160A computer I/O is not full duplex, this cycle time is broken into four quarter cycles. Each quarter is assigned to an apparent computer (TS₁, TS₂, BB₁, or BB₂). The CCC Simulation Program has a 40 Interrupt schedule where it interleaves the 40 interrupts as follows, TS₁, BB₁, TS₂, BB₂, TS₁, etc. Each of these apparent computers must service the 40 Interrupt within a preset time. It is approximately 1.80 milliseconds for the BB and 1.85 milliseconds for the TS. If no datum is being transmitted between the BB computer and the CCC Simulation computer, the cycle time is 6.7 milliseconds, and 13.3 whenever a datum transfer is required. This is the same for the interface between the CCC Simulator computer and the TS Computer. These 40 interrupts are independent of one another, such that the BB could be on a 6.7 millisecond cycle while the TS is on a 13.3 millisecond cycle time.

STORAGE

| | | |
|--------------------|-------------------|--------|
| Load Start Address | "0000" | Bank 0 |
| END Address | 1625 ₈ | |

VALIDATION TESTS

Two types of validation tests were used, one called the "Test Transmission" program and the second referred to as "BB & TS operational check."

The BB & TS operational check is loaded into both the TS & BB computers. If the cabling and computer Jump switches are set correctly, the CCC Simulator program will cycle with the TS & BB programs, and the three computers will halt at some predetermined point in their respective programs. The P stop number is varied if the cycle time is varied. If the computers fail to cycle, a CDC, CE should be asked to assist in determining the fault. (This program is the second tape in the box that stores the CCC Simulator tape in the CPDC.)

The Test Transmission program (Appendix C) is designed to use the type-writer to print out a "go" condition. If the printout fails and the Jump switches are set correctly, a CDC, CE should be asked to assist in determining the fault. Programs are available with cycle times of 12.1, 13.5 and 13.3 milliseconds or adjust locations 1222 & 1521 as desired.

REFERENCES

SDC Library Document No. 30129, "Report on CCC Simulation", 25 January 1963.

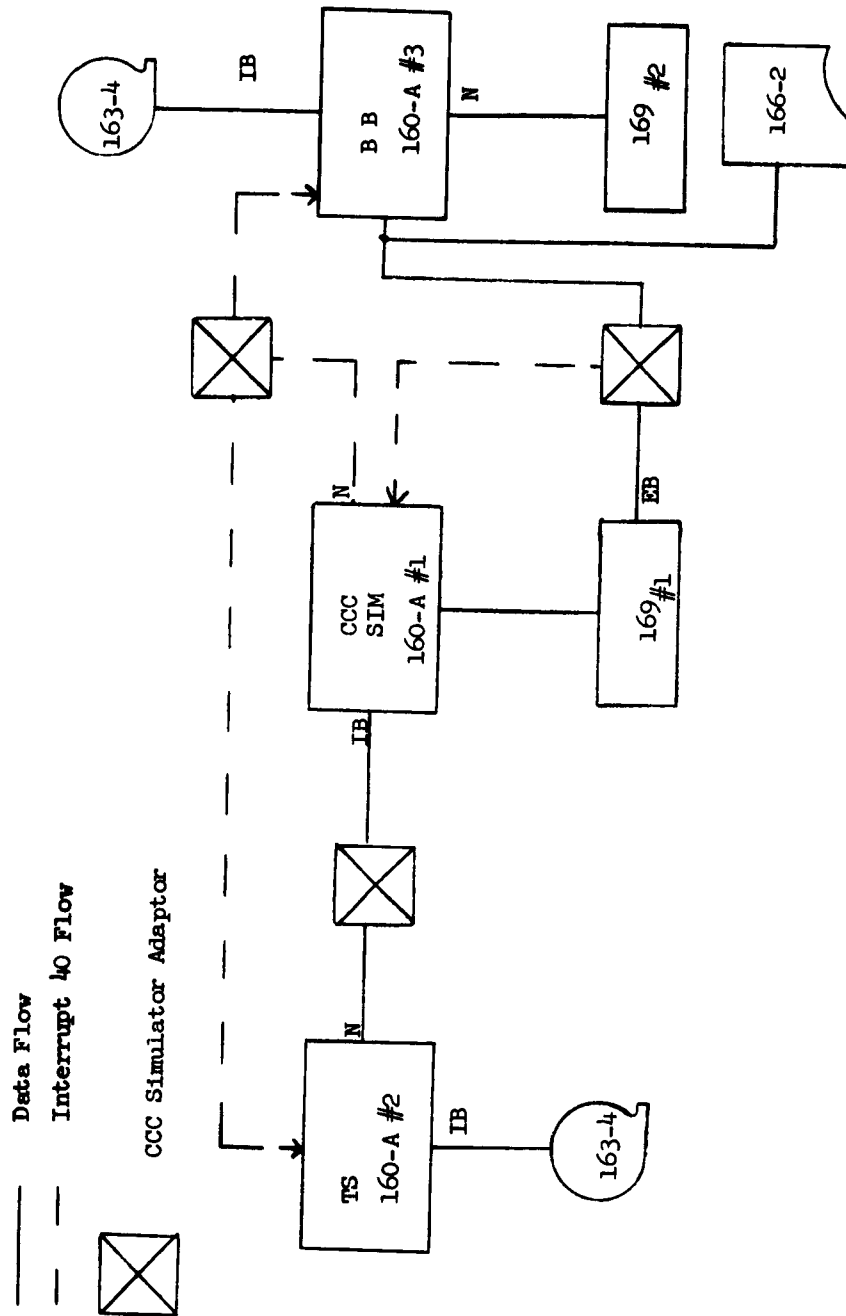


Figure 1: CCC Simulation System

20 March 1963

-9-
(Page 10 Blank)

TM-1003/010/00

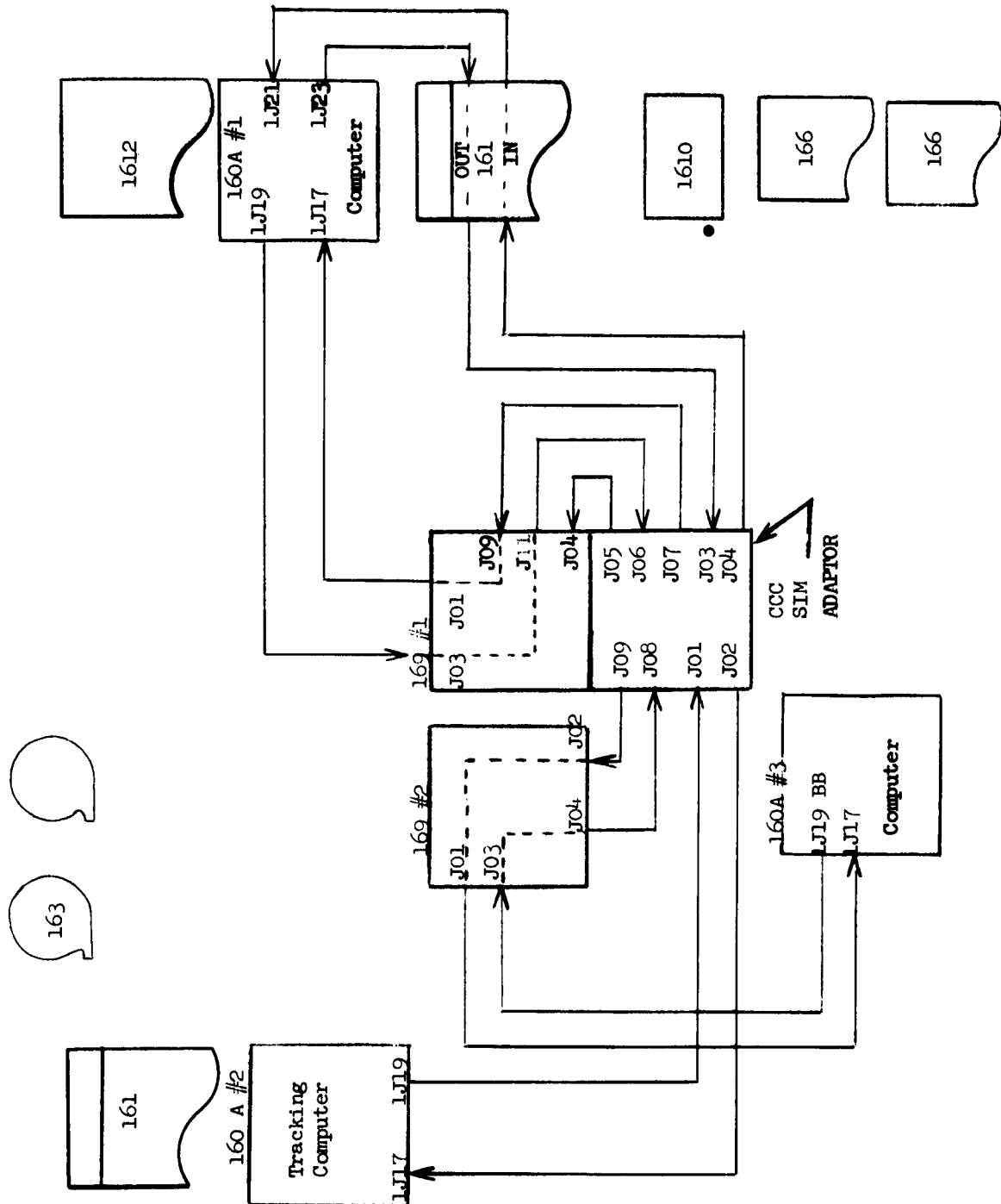
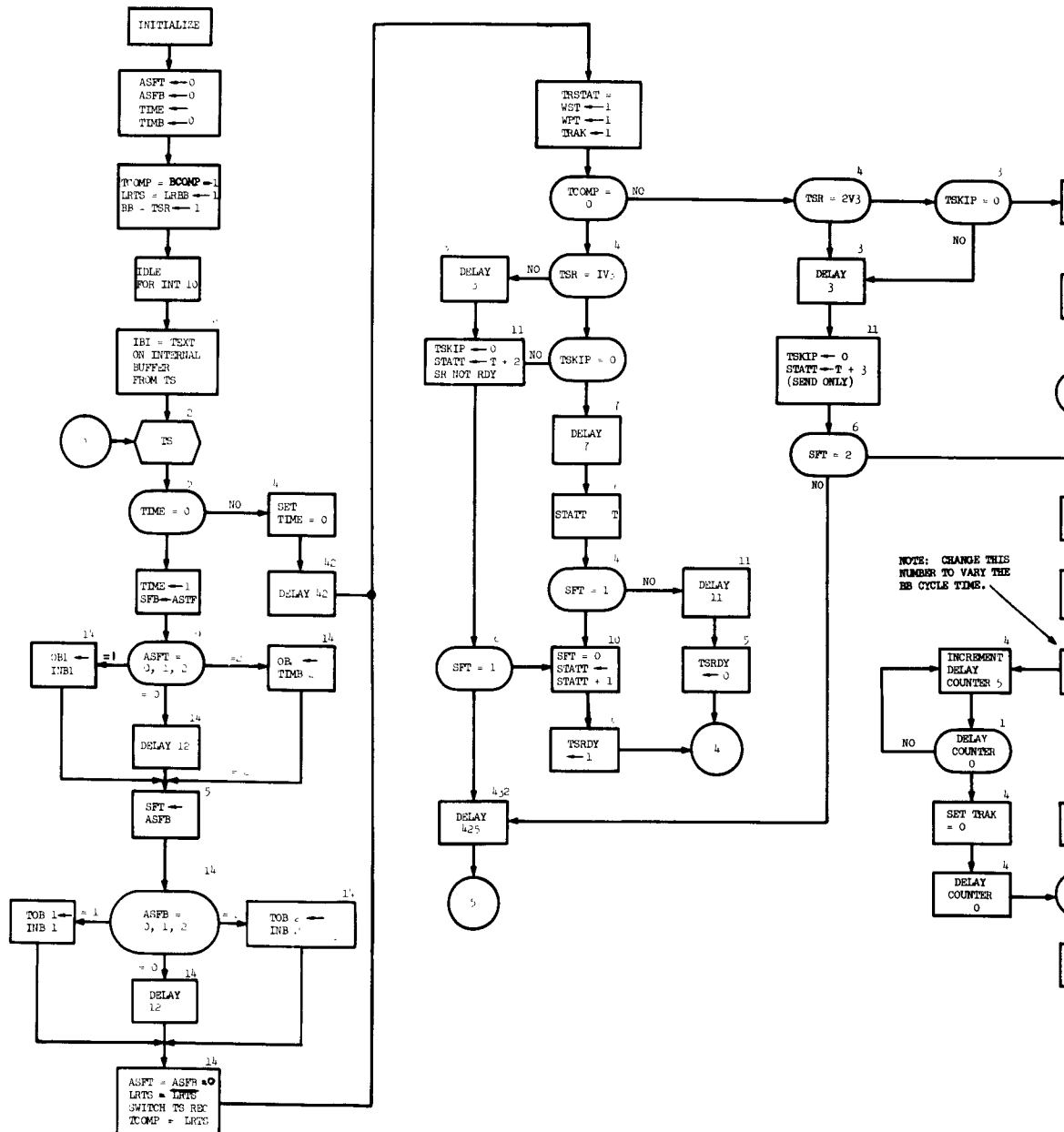


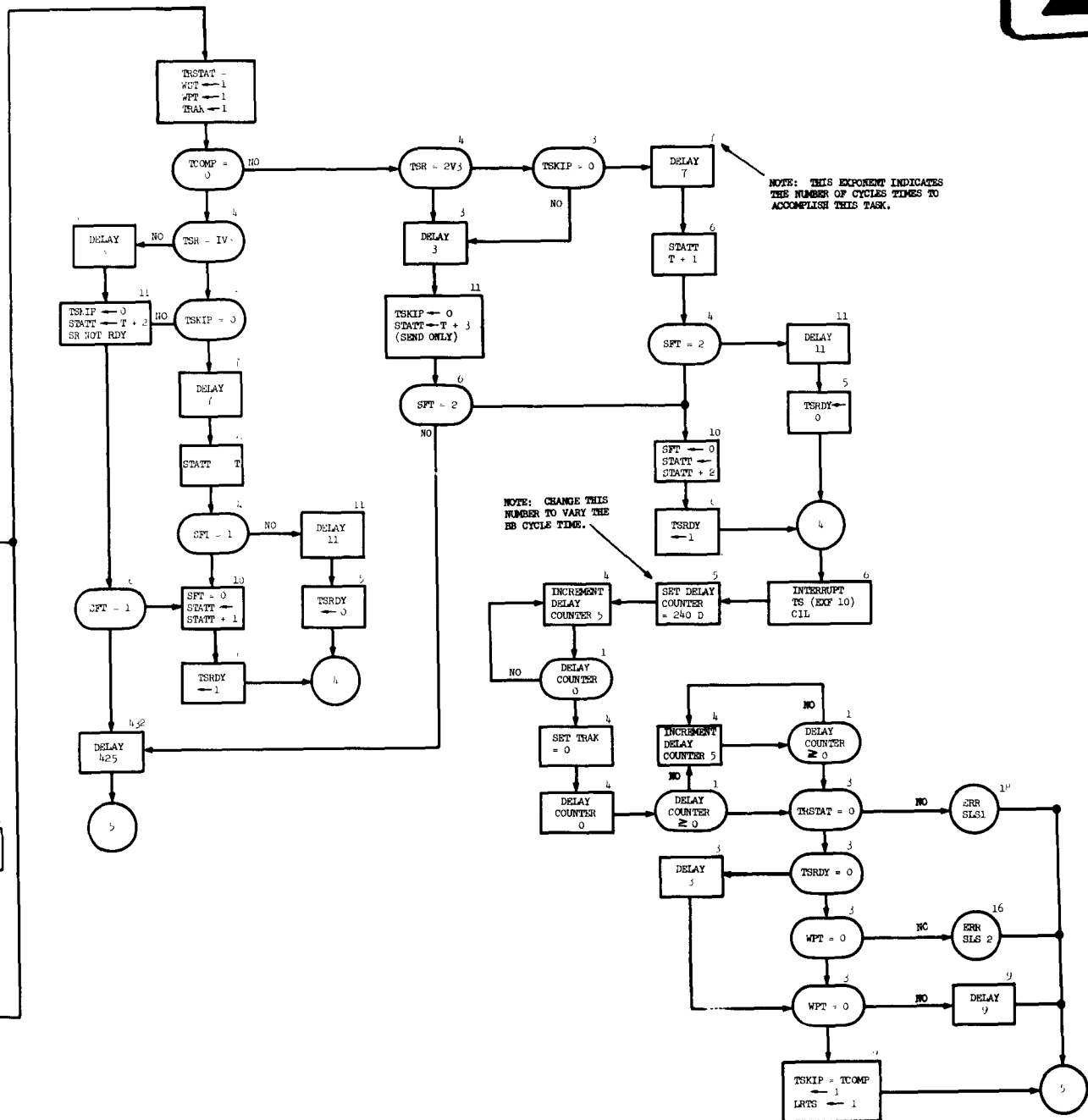
Figure 2: CCC Simulator Cabling

26 March 1963



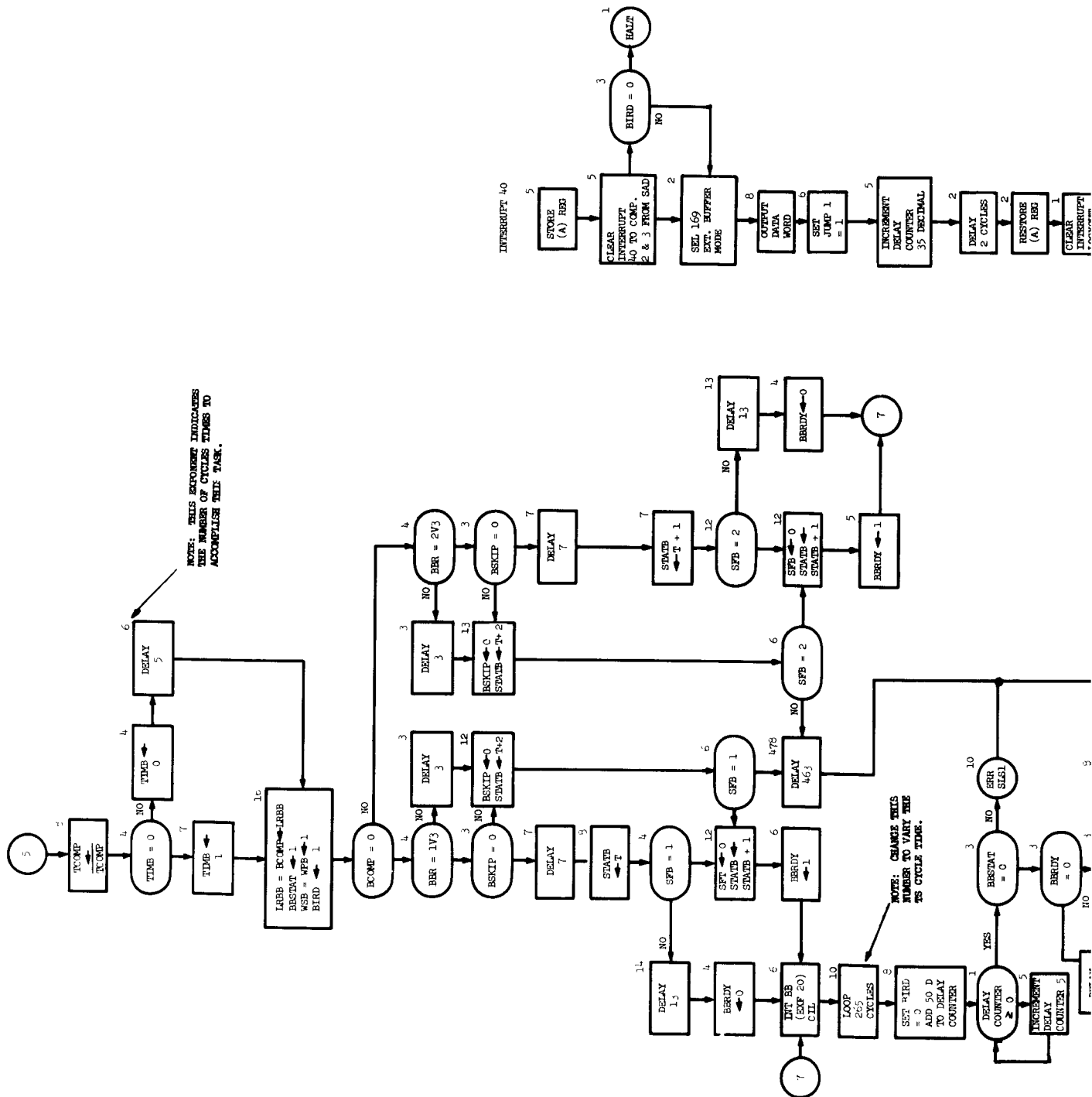
APPENDIX A

2

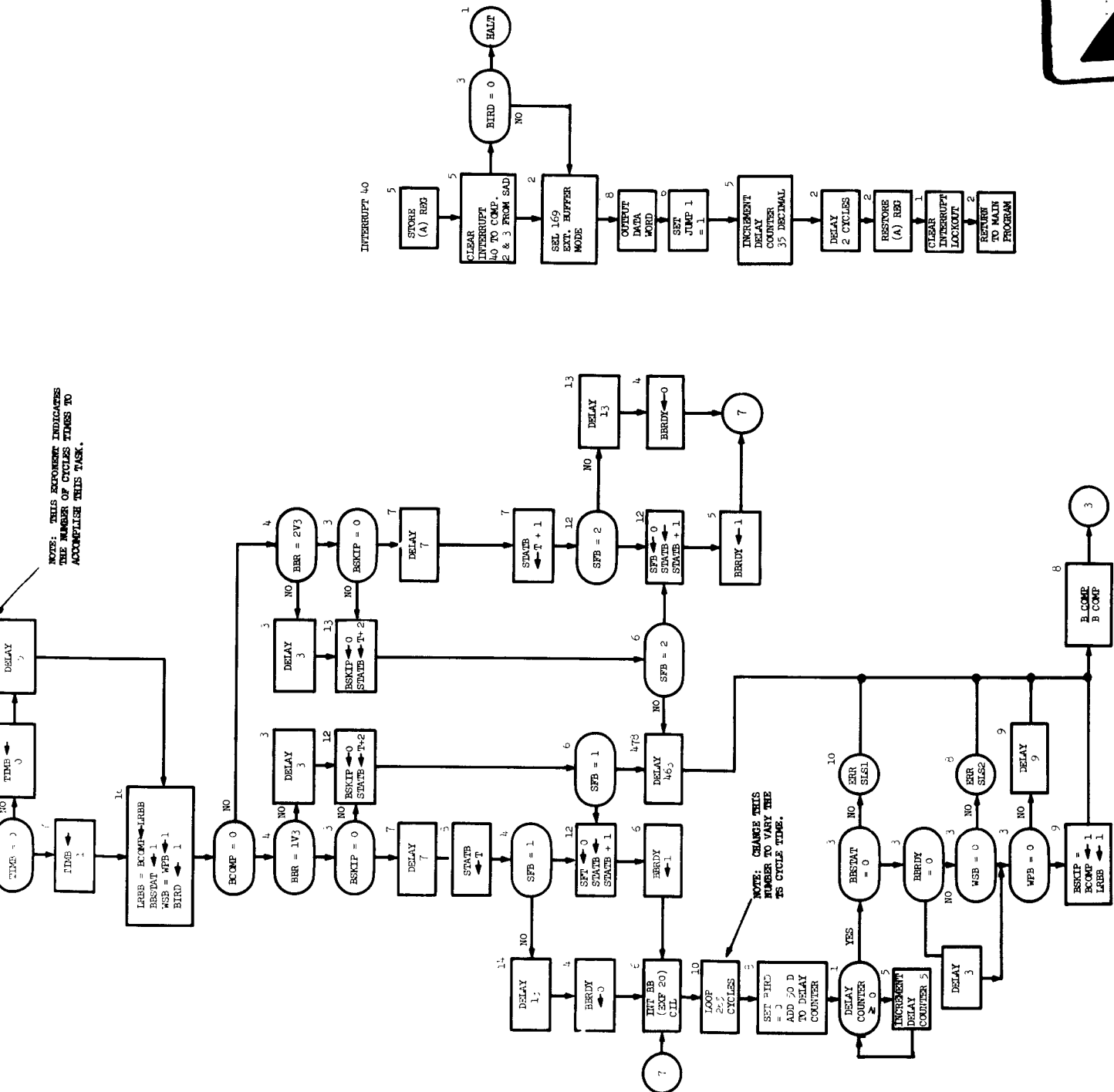


-12-

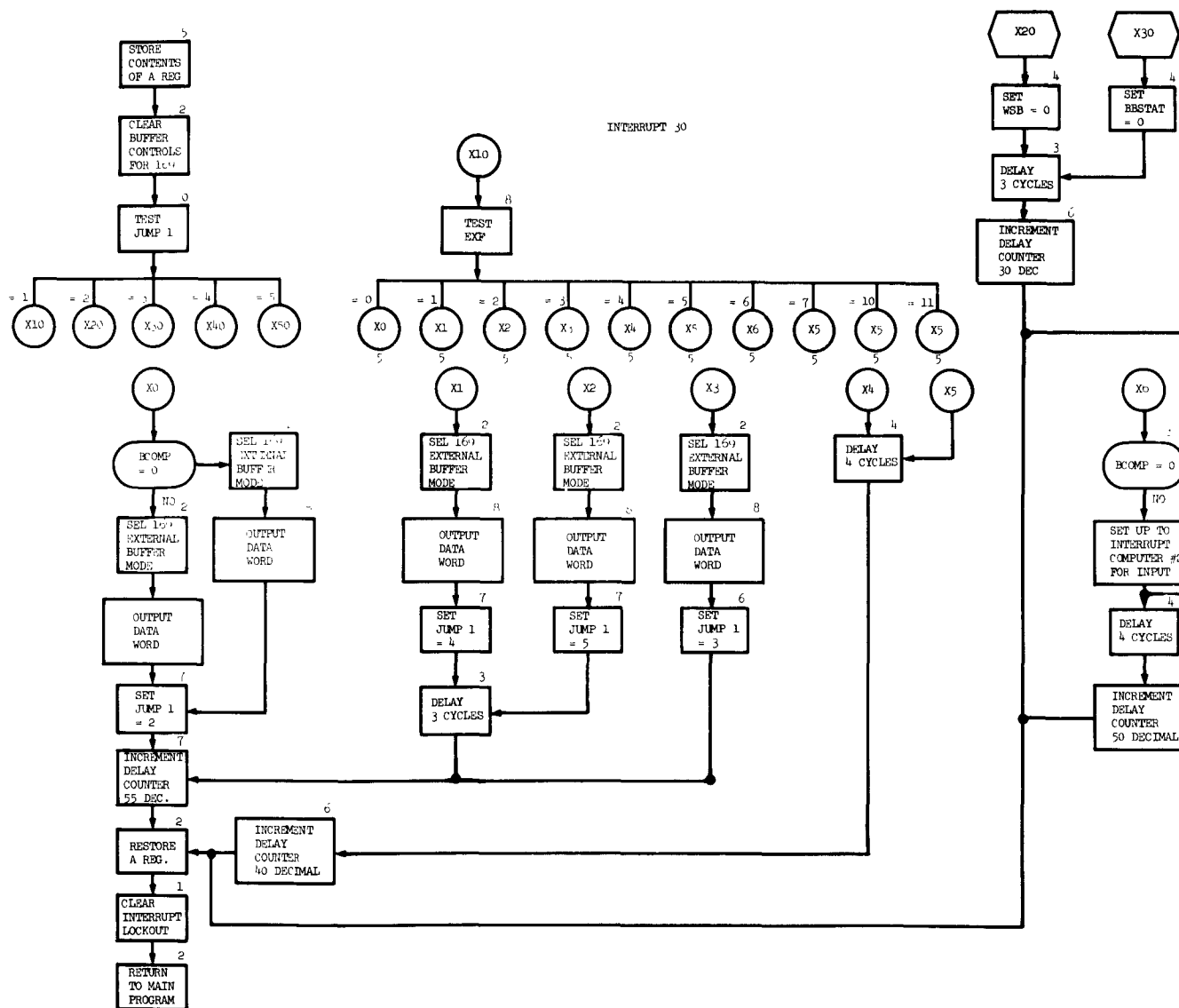
1



NOTE: THIS EXPONENT INDICATES THE NUMBER OF CYCLES TIMES TO ACCOMPLISH THIS TASK.



- 13 -

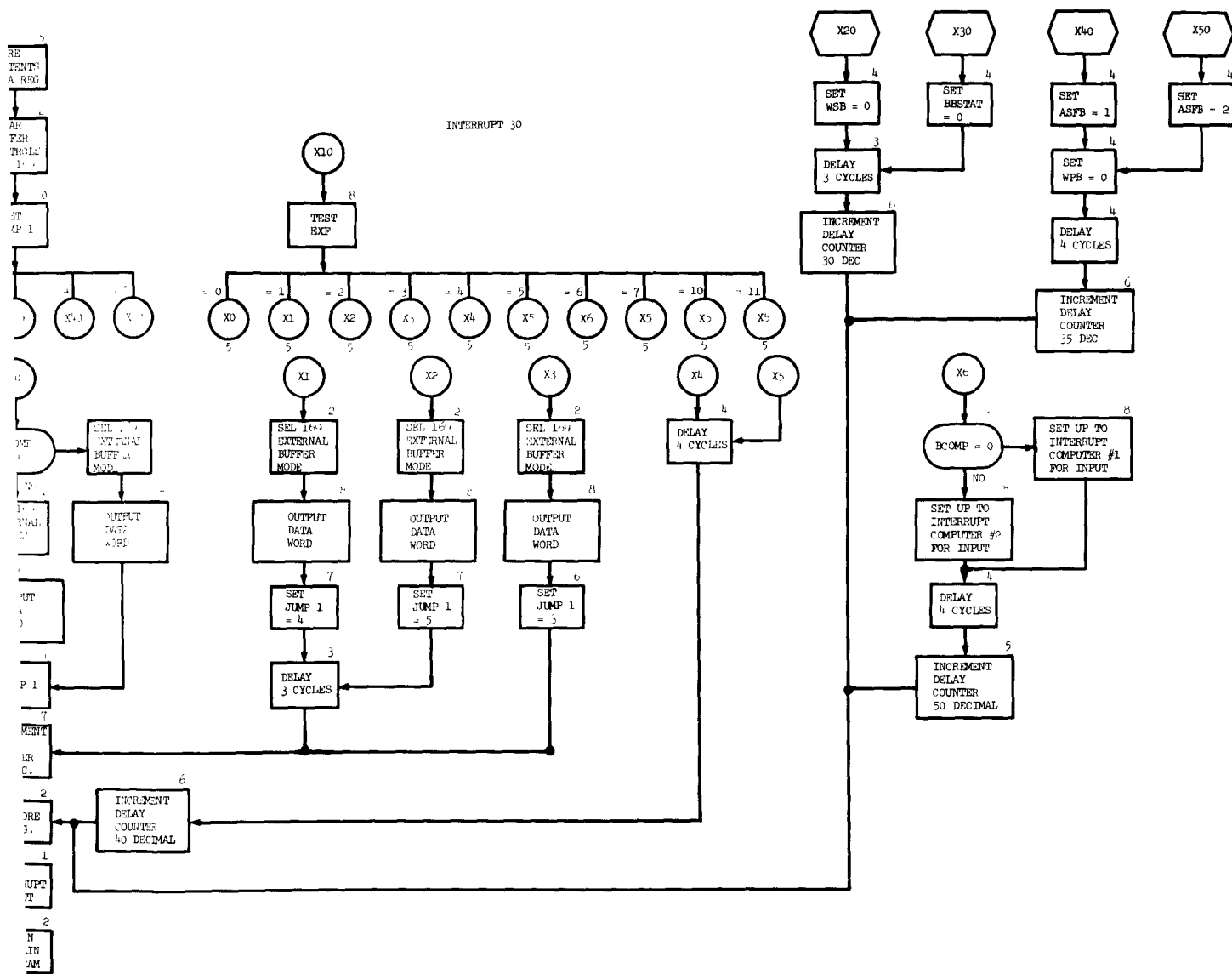


26 March 1963

-13-

TM-1003/010/0

2

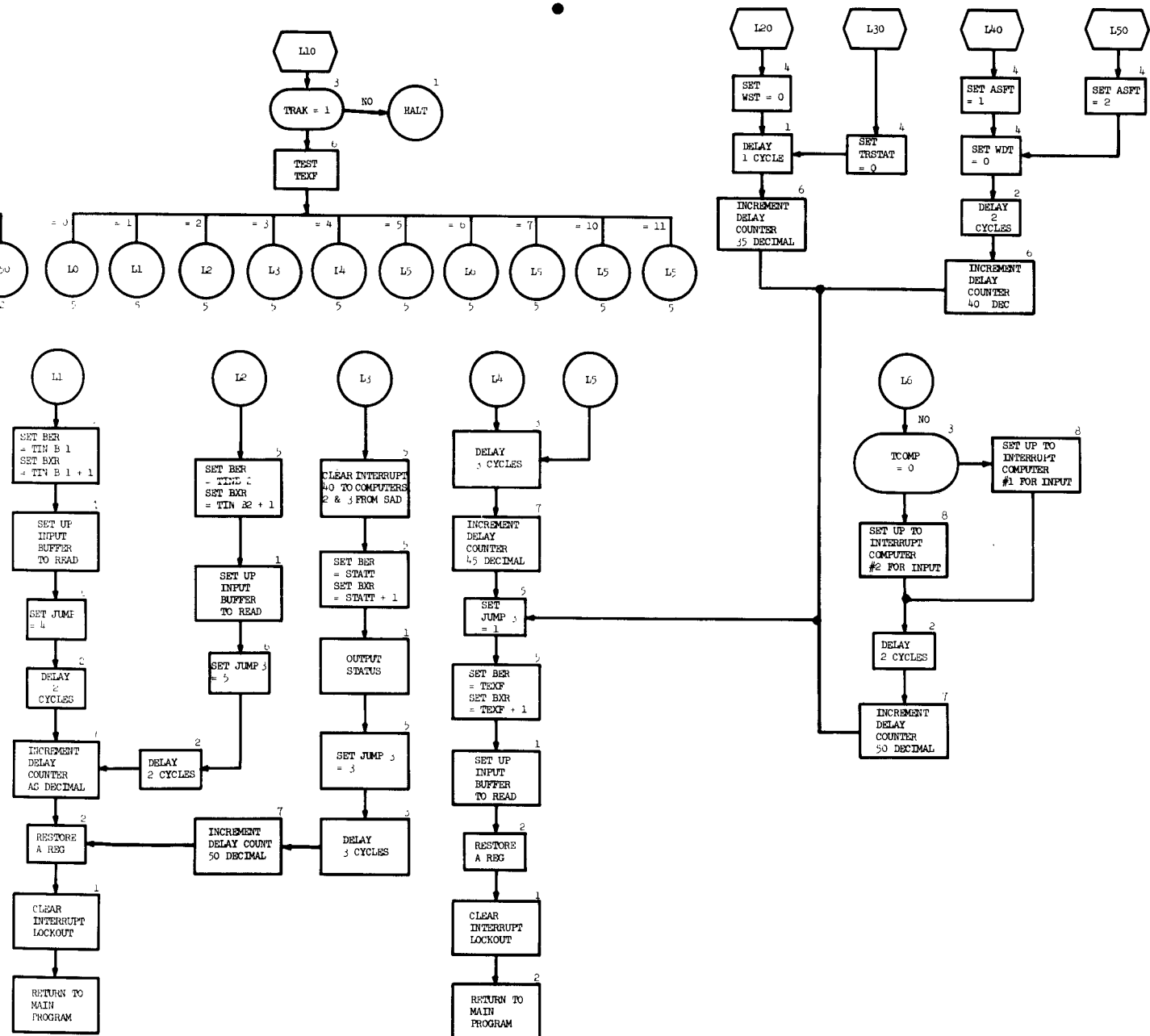


26 March 1963

-14-

TM-1003/010/0

2



26 March 1963

-15-

TM-1003/010/00

APPENDIX B

| | | | | |
|------|------|--------|-------|---------------------------|
| 0000 | 0000 | CON | 0 | |
| 0001 | 0060 | SIDJ | | |
| 0002 | 7101 | JFI | 1 | SET I AND n BANKS TO ZERO |
| 0003 | 0712 | | START | |
| 0004 | 0000 | ASFT | | AUXIL SEND FLAG TS |
| 0005 | 0000 | ASFB | | AUXIL SEND FLAG BB |
| 0006 | 0000 | TIME | | |
| 0007 | 0000 | TCOMP | | TS COMPUTER |
| 0008 | 0000 | BCOMP | | BB COMPUTER |
| 0009 | 0000 | INT10 | | |
| 0010 | 7101 | JFI | 1 | |
| 0011 | 1613 | | UPBUF | |
| 0012 | 0000 | LRTS | | LAST REC TS |
| 0013 | 0000 | LHBB | | LAST REC BB |
| 0014 | 0000 | SFT | | SEND FLAG TS |
| 0015 | 0000 | SFB | | SEND FLAG BB |
| 0016 | 0000 | AREG | | A REGISTER |
| 0017 | 0000 | INT20 | 0 | |
| 0018 | 4017 | STD | AREG | |
| 0019 | 7101 | JUMPJ | JFI | |
| 0020 | 0412 | | L10 | |
| 0021 | 0616 | | L20 | |
| 0022 | 0624 | | L30 | |
| 0023 | 0632 | | L40 | |
| 0024 | 0643 | | L50 | |
| 0025 | 0000 | INT30 | 0 | |
| 0026 | 4017 | STD | AREG | |
| 0027 | 7101 | JFI | 1 | |
| 0028 | 0100 | | R30 | |
| 0029 | 0040 | CON | 40 | |
| 0030 | 0000 | INT40 | 0 | |
| 0031 | 4017 | STD | AREG | |
| 0032 | 7101 | JFI | 1 | |
| 0033 | 0110 | | R40 | |
| 0034 | 0090 | CON | 90 | |
| 0035 | 0000 | TRSTAT | | STATUS ASKED TS |
| 0036 | 0000 | WST | | WORD PU |
| 0037 | 0000 | WPT | | WORD SENT |
| 0038 | 0000 | TSRDY | | RDY TO SEND FLAG |
| 0039 | 0000 | TSR | | TS REC FLAG |
| 0040 | 0000 | TSKIP | | TS SKIP REC FLAG |
| 0041 | 0000 | BBSTAT | | |
| 0042 | 0000 | WBB | | |
| 0043 | 0000 | WFB | | |
| 0044 | 0000 | BBR | | |
| 0045 | 0000 | BBSKIP | | |
| 0046 | 0000 | BBRDY | | |
| 0047 | 0000 | STATW | | BB STATUS WORD |
| 0048 | 0000 | STATF | | TS |
| 0049 | 0000 | TIME | | |
| 0050 | 0000 | JUNK | | |
| 0051 | 0000 | BIRD | | |
| 0052 | 0000 | TRAK | | |
| 0053 | 0100 | PRG | 100 | |
| 0054 | 7500 | R30 | EXC | 4702 |
| 0055 | 4702 | | | |
| 0056 | 7101 | JUMP1 | JFI | 1 |
| 0057 | 0143 | | X10 | |
| 0058 | 0390 | | X20 | |
| 0059 | 0396 | | X30 | |

26 March 1963

-16-

TM-1003/010/00

| | | | | | |
|------|------|-----|------|-------|-----------------|
| 0106 | 0364 | | | X40 | |
| 0107 | 0375 | | | X50 | |
| 0110 | 7500 | X40 | EXC | 30 | |
| 0111 | 0030 | | | | |
| 0112 | 2070 | | LDD | HIRD | |
| 0113 | 6104 | | NZF | 4 | |
| 0114 | 7700 | | MLT | | |
| 0115 | 7101 | | JFI | 1 | BE NOT IN TIME |
| 0116 | 0712 | | | START | |
| 0117 | 7500 | | EXC | 4701 | |
| 0120 | 4701 | | | | |
| 0121 | 7315 | | OUT | 15 | |
| 0122 | 0143 | | | R | +4 |
| 0123 | 2200 | | LDC | 7101 | |
| 0124 | 7101 | | | | |
| 0125 | 4100 | | STM | JUMP1 | |
| 0126 | 0102 | | | | |
| 0127 | 2200 | | LDC | 40D | |
| 0130 | 0050 | | | | |
| 0131 | 5067 | | MAD | JUNK | |
| 0132 | 2010 | | LDD | INT10 | |
| 0133 | 2017 | | LDD | AREG | |
| 0134 | 0120 | | CIL | | |
| 0135 | 7040 | | JFI | INT40 | |
| 0136 | 0137 | | | R | |
| 0137 | 4012 | R | | 4012 | |
| 0140 | 0700 | | | EXF | |
| 0141 | 0701 | | | EXF | +1 |
| 0142 | 0000 | | | 0 | |
| 0143 | 0022 | X10 | MEM | | ANAL EXF 30 INT |
| 0144 | 2100 | | SIC2 | | |
| 0145 | 0700 | | LDM | EXF | |
| 0146 | 0020 | | | | |
| 0147 | 0277 | | SICO | | |
| 0150 | 3200 | | LPA | 77 | |
| 0151 | 7101 | | ADC | 7101 | |
| 0152 | 4201 | | STF | 1 | |
| 0153 | 0000 | | | 0 | |
| 0154 | 0166 | | | X0 | 5500 |
| 0155 | 0230 | | | X1 | 01 |
| 0156 | 0246 | | | X2 | 02 |
| 0157 | 0271 | | | X3 | 03 |
| 0160 | 0312 | | | X4 | 04 |
| 0161 | 0317 | | | X5 | 05 |
| 0162 | 0324 | | | X6 | 06 |
| 0163 | 0317 | | | X9 | 07 |
| 0164 | 0317 | | | X9 | 10 |
| 0165 | 0317 | | | X9 | 11 |
| 0166 | 2007 | X0 | LDD | BCOMP | |
| 0167 | 6013 | | ZJF | X0.1 | |
| 0170 | 7500 | | EXC | 4701 | COMP 2 |
| 0171 | 4701 | | | | |
| 0172 | 7307 | | OUT | 7 | |
| 0173 | 0224 | | | X0.5 | +4 |
| 0174 | 2200 | | LDC | 7102 | |
| 0175 | 7102 | | | | |
| 0176 | 4100 | | STM | JUMP1 | |
| 0177 | 0102 | | | | |
| 0200 | 6314 | | NJF | X0.4 | |

26 March 1963

-17-

TM-1003/010/00

| | | | | | |
|------|------|------|-----|-------|----------------|
| 0201 | 0220 | | | X0.5 | |
| 0202 | 7500 | X0.1 | EXC | 4701 | COMP 1 |
| 0203 | 4701 | | | | |
| 0204 | 7307 | | OUT | 7 | |
| 0205 | 0250 | | | X0.6 | +4 |
| 0206 | 2200 | | LDC | 7102 | |
| 0207 | 7102 | | | | |
| 0210 | 4100 | | STM | JUMP1 | |
| 0211 | 0102 | | | | |
| 0212 | 6302 | | NJF | X0.4 | |
| 0213 | 0224 | | | X0.6 | |
| 0214 | 2200 | X0.4 | LDC | 550 | NO CYCLES#5500 |
| 0215 | 0067 | | | | |
| 0216 | 7101 | | JFI | 1 | |
| 0217 | 0344 | | | X8 | |
| 0220 | 4002 | X0.5 | | 4002 | |
| 0221 | 0704 | | | 082 | |
| 0222 | 0705 | | | 082 | +1 |
| 0223 | 0000 | | | 0 | |
| 0224 | 4002 | X0.6 | | 4002 | |
| 0225 | 0703 | | | 091 | |
| 0226 | 0704 | | | 081 | +1 |
| 0227 | 0000 | | | 0 | |
| 0230 | 7500 | X1 | EXC | 4701 | |
| 0231 | 4701 | | | | |
| 0232 | 7307 | | OUT | 7 | |
| 0233 | 0246 | | | X1.5 | +4 |
| 0234 | 2200 | | LDC | 7104 | |
| 0235 | 7104 | | | | |
| 0236 | 4100 | | STM | JUMP1 | |
| 0237 | 0102 | | | | |
| 0240 | 6324 | | NJF | X2.6 | |
| 0241 | 0242 | | | X1.5 | |
| 0242 | 4012 | X1.5 | | 4012 | |
| 0243 | 0701 | | | INB1 | |
| 0244 | 0702 | | | INB1 | +1 |
| 0245 | 0000 | | | 0 | |
| 0246 | 7500 | X2 | EXC | 4701 | |
| 0247 | 4701 | | | | |
| 0250 | 7307 | | OUT | 7 | |
| 0251 | 0264 | | | X2.5 | +4 |
| 0252 | 2200 | | LDC | 7105 | |
| 0253 | 7105 | | | | |
| 0254 | 4100 | | STM | JUMP1 | |
| 0255 | 0102 | | | | |
| 0256 | 6306 | | NJF | X2.6 | |
| 0257 | 0260 | | | X2.5 | |
| 0260 | 4012 | X2.5 | | 4012 | |
| 0261 | 0702 | | | INB2 | |
| 0262 | 0703 | | | INB2 | +1 |
| 0263 | 0000 | | | 0 | |
| 0264 | 2200 | X2.6 | LDC | 550 | NO CYCLES 71#2 |
| 0265 | 0067 | | | | |
| 0266 | 4020 | | STD | INT20 | |
| 0267 | 7101 | | JFI | 1 | |
| 0270 | 0344 | | | X8 | |
| 0271 | 7500 | X3 | EXC | 4701 | |
| 0272 | 4701 | | | | |
| 0273 | 7312 | | OUT | 12 | |

26 March 1963

-18-

TM-1003/010/00

| | | | | | |
|------|------|------|-------|-------|-------------------|
| 0274 | 0312 | | X3.5 | +4 | |
| 0275 | 2200 | LDC | 7103 | | |
| 0276 | 7103 | | | | |
| 0277 | 4100 | STM | JUMP1 | | |
| 0300 | 0102 | | | | |
| 0301 | 2200 | LDC | 55P | | NO CYC. 03 |
| 0302 | 0067 | | | | |
| 0303 | 7101 | JFI | 1 | | |
| 0304 | 0344 | | X8 | | |
| 0305 | 0306 | | X3.5 | | |
| 0306 | 4002 | X3.5 | 4002 | | |
| 0307 | 0064 | | STATW | | |
| 0310 | 0065 | | STATW | +1 | |
| 0311 | 0000 | | 0 | | |
| 0312 | 2200 | X4 | LDC | 40D | NO CYC 04 |
| 0313 | 0050 | | | | |
| 0314 | 4100 | STM | INT10 | | |
| 0315 | 0010 | | | | |
| 0316 | 6226 | PJF | X8 | | |
| 0317 | 2200 | X5 | LDC | 40D | DISREGARD 15 |
| 0320 | 0050 | | | | |
| 0321 | 4100 | STM | INT10 | | |
| 0322 | 0010 | | | | |
| 0323 | 6221 | PJF | X8 | | |
| 0324 | 2007 | X6 | LDD | HCOMP | |
| 0325 | 6006 | | ZJF | X6,0 | |
| 0326 | 2061 | | LDD | BHR | COMP 2 |
| 0327 | 0201 | | LPA | 1 | |
| 0330 | 0602 | | ADN | 2 | |
| 0331 | 4061 | | STD | BHR | |
| 0332 | 6206 | | PJF | X6,1 | |
| 0333 | 2061 | X6.0 | LDD | BHR | COMP 1 |
| 0334 | 0202 | | LPA | 2 | |
| 0335 | 0601 | | ADN | 1 | |
| 0336 | 4061 | | STD | BHR | |
| 0337 | 6201 | | PJF | X6,1 | |
| 0340 | 2200 | X6.1 | LDC | 50D | NO CYC 06 |
| 0341 | 0062 | | | | |
| 0342 | 4100 | STM | INT10 | | |
| 0343 | 0010 | | | | |
| 0344 | 5067 | X8 | RAD | JUNK | |
| 0345 | 2017 | | LDD | AREG | |
| 0346 | 0120 | | GIL | | |
| 0347 | 7030 | | JPI | INT30 | |
| 0350 | 0400 | X20 | LDA | 0 | |
| 0351 | 4057 | | STD | WBR | |
| 0352 | 2200 | | LDC | 30D | NO CYC AFTER 5500 |
| 0353 | 0036 | | | | |
| 0354 | 4010 | | STD | INT10 | |
| 0355 | 6231 | | PJF | X55 | |
| 0356 | 0400 | X30 | LDA | 0 | |
| 0357 | 4056 | | STD | WBR | |
| 0360 | 2200 | | LDC | 30D | NO CYC AFTER 5503 |
| 0361 | 0036 | | | | |
| 0362 | 4010 | | STD | INT10 | |
| 0363 | 6223 | | PJF | X55 | |
| 0364 | 0400 | X40 | LDA | 0 | |
| 0365 | 4060 | | STD | WBR | |
| 0366 | 0401 | | LDA | 1 | |
| 0367 | 4004 | | STD | ASFR | |

26 March 1963

-19-

TM-1003/010/00

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|------|------|-------|-----|-------|----------------------|
| 0370 | 2200 | | LDC | JSD | NO CYC AFTER 5501 |
| 0371 | 0043 | | | | |
| 0372 | 4100 | | STM | INT10 | |
| 0373 | 0010 | | | | |
| 0374 | 6212 | | PJF | X55 | |
| 0375 | 0400 | X50 | LON | 0 | |
| 0376 | 4060 | | STD | WPB | |
| 0377 | 0402 | | LON | 2 | |
| 0400 | 4004 | | STD | ASFR | |
| 0401 | 2200 | | LDC | JSD | NO CYCLES AFTER 5502 |
| 0402 | 0043 | | | | |
| 0403 | 4100 | | STM | INT10 | |
| 0404 | 0010 | | | | |
| 0405 | 6201 | | PJF | X55 | |
| 0406 | 5067 | X55 | KAC | JUNK | |
| 0407 | 2017 | | LDD | AREG | |
| 0410 | 0120 | | CIL | | |
| 0411 | 7030 | | JPI | INT30 | |
| 0412 | 2071 | L10 | LDD | TRAK | |
| 0413 | 6104 | | NZF | 4 | |
| 0414 | 7700 | | MLT | | |
| 0415 | 7101 | | JFI | 1 | |
| 0416 | 0712 | | | START | |
| 0417 | 2100 | | LDM | TEXF | |
| 0420 | 0705 | | | | |
| 0421 | 0277 | | LPA | 77 | |
| 0422 | 3200 | | ADC | 7101 | |
| 0423 | 7101 | | | | |
| 0424 | 4201 | | STF | 1 | |
| 0425 | 0000 | | | 0 | |
| 0426 | 0440 | | | L0 | 5500 |
| 0427 | 0500 | | | L1 | 01 |
| 0430 | 0515 | | | L2 | 02 |
| 0431 | 0540 | | | L3 | 03 |
| 0432 | 0562 | | | L4 | 04 |
| 0433 | 0566 | | | L5 | 05 |
| 0434 | 0572 | | | L6 | 06 |
| 0435 | 0566 | | | L5 | 07 |
| 0436 | 0566 | | | L5 | 10 |
| 0437 | 0566 | | | L5 | 11 |
| 0440 | 2006 | L0 | LDD | TCOMP | |
| 0441 | 6016 | | ZJF | L0,1 | |
| 0442 | 2200 | | LDC | T0B2 | COMP2 |
| 0443 | 0711 | | | | |
| 0444 | 0105 | L00,1 | ATE | L00,1 | |
| 0445 | 0444 | | | | |
| 0446 | 0601 | | ADN | 1 | |
| 0447 | 0106 | | ATX | L00,1 | +3 |
| 0450 | 0447 | | | | |
| 0451 | 7300 | | IBO | L00,1 | +5 |
| 0452 | 0451 | | | | |
| 0453 | 2200 | | LDC | 7102 | |
| 0454 | 7102 | | | | |
| 0455 | 4022 | | STD | JUMP3 | |
| 0456 | 6316 | | NJF | L0,4 | |
| 0457 | 2200 | L0,1 | LDC | T0B1 | |
| 0460 | 0710 | | | | |
| 0461 | 0105 | L00,2 | ATE | L00,2 | |
| 0462 | 0461 | | | | |
| 0463 | 0601 | | ADN | 1 | |

26 March 1963

-20-

TM 1003/010/00

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|------|------|-------|-----|-------|----|-------------|
| 0464 | 0106 | | ATX | L00,2 | +3 | |
| 0465 | 0464 | | | | | |
| 0466 | 7300 | | IBO | L00,2 | +3 | |
| 0467 | 0466 | | | | | |
| 0470 | 2200 | | LDC | 7102 | | |
| 0471 | 7102 | | | | | |
| 0472 | 4022 | | STD | JUMP3 | | |
| 0473 | 6301 | | NJF | L0,4 | | |
| 0474 | 2200 | L0,4 | LDC | 50D | | |
| 0475 | 0062 | | | | | |
| 0476 | 7101 | | JFI | 1 | | |
| 0477 | 0612 | | | L8 | | |
| 0500 | 2200 | L1 | LDC | TIN91 | | |
| 0501 | 0706 | | | | | |
| 0502 | 0105 | L11,1 | ATE | L11,1 | | |
| 0503 | 0502 | | | | | |
| 0504 | 0601 | | ADA | 1 | | |
| 0505 | 0106 | | ATX | L11,1 | +3 | |
| 0506 | 0505 | | | | | |
| 0507 | 7200 | | IBI | L11,1 | +3 | |
| 0510 | 0507 | | | | | |
| 0511 | 2200 | | LDC | 7104 | | |
| 0512 | 7104 | | | | | |
| 0513 | 4022 | | STD | JUMP3 | | |
| 0514 | 6316 | | NJF | L2,6 | | |
| 0515 | 2200 | L2 | LDC | TIN92 | | |
| 0516 | 0707 | | | | | |
| 0517 | 0105 | L22,1 | ATE | L22,1 | | |
| 0520 | 0517 | | | | | |
| 0521 | 0601 | | ADA | 1 | | |
| 0522 | 0106 | | ATX | L22,1 | +3 | |
| 0523 | 0522 | | | | | |
| 0524 | 7200 | | IBI | L22,1 | +3 | |
| 0525 | 0524 | | | | | |
| 0526 | 2200 | | LDC | 7105 | | |
| 0527 | 7105 | | | | | |
| 0530 | 4022 | | STD | JUMP3 | | |
| 0531 | 6301 | | NJF | L2,6 | | |
| 0532 | 2200 | L2,6 | LDC | 50D | | |
| 0533 | 0062 | | | | | NU CVC 01-2 |
| 0534 | 0277 | | LPN | 77 | | |
| 0535 | 0277 | | LPN | 77 | | |
| 0536 | 7101 | | JFI | 1 | | |
| 0537 | 0612 | | | L8 | | |
| 0540 | 7500 | L3 | EXC | 30 | | |
| 0541 | 0030 | | | | | |
| 0542 | 2200 | | LDC | STAT7 | | |
| 0543 | 0065 | | | | | |
| 0544 | 0105 | L33,1 | ATE | L33,1 | | |
| 0545 | 0544 | | | | | |
| 0546 | 0601 | | ADA | 1 | | |
| 0547 | 0106 | | ATX | L33,1 | +3 | |
| 0550 | 0547 | | | | | |
| 0551 | 7300 | | IBO | L33,1 | +3 | |
| 0552 | 0551 | | | | | |
| 0553 | 2200 | | LDC | 7103 | | |
| 0554 | 7103 | | | | | |
| 0555 | 4022 | | STD | JUMP3 | | |
| 0556 | 2200 | | LDC | 50D | | NU CVC 5503 |
| 0557 | 0062 | | | | | |

26 March 1963

-21-

TM-1003/010/00

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|------|------|------|-----|--------|---------------------|
| 0560 | 7101 | | JFI | 1 | |
| 0561 | 0612 | | | L8 | |
| 0562 | 2200 | L4 | LDC | 45D | NO CYCLES 5504 |
| 0563 | 0055 | | | | |
| 0564 | 7101 | | JFI | 1 | |
| 0565 | 0654 | | | L55 | |
| 0566 | 2200 | L5 | LDC | 45D | |
| 0567 | 0055 | | | | |
| 0570 | 7101 | | JFI | 1 | |
| 0571 | 0654 | | | L55 | |
| 0572 | 2006 | L6 | LDD | TCOMP | |
| 0573 | 6006 | | ZJF | L6,0 | |
| 0574 | 2054 | | LDD | TSR | COMP2 |
| 0575 | 0201 | | LPN | 1 | |
| 0576 | 0602 | | ADN | 2 | |
| 0577 | 4054 | | STD | TSR | |
| 0600 | 6206 | | PJF | L6,1 | |
| 0601 | 2054 | L6,0 | LDD | TSR | COMP1 |
| 0602 | 0202 | | LPN | 2 | |
| 0603 | 0601 | | ADN | 1 | |
| 0604 | 4054 | | STD | TSR | |
| 0605 | 6201 | | PJF | L6,1 | |
| 0606 | 2200 | L6,1 | LDC | 50D | |
| 0607 | 0062 | | | | |
| 0610 | 7101 | | JFI | 1 | |
| 0611 | 0654 | | | L55 | |
| 0612 | 5067 | L8 | NAD | JUNK | |
| 0613 | 2017 | | LDD | AREG | |
| 0614 | 0120 | | CIL | | |
| 0615 | 7020 | | JFI | INT20 | |
| 0616 | 0400 | L20 | LDN | 0 | |
| 0617 | 4051 | | STD | WST | |
| 0620 | 2200 | | LDC | 35D | NO CYCLE AFTER 5500 |
| 0621 | 0043 | | | | |
| 0622 | 0277 | | LPN | 77 | |
| 0623 | 6231 | | PJF | L55 | |
| 0624 | 0400 | L30 | LDN | 0 | |
| 0625 | 4050 | | STD | TRSTAT | |
| 0626 | 2200 | | LDC | 35D | NO CYCLE AFTER 5503 |
| 0627 | 0043 | | | | |
| 0630 | 0277 | | LPN | 77 | |
| 0631 | 6223 | | PJF | L55 | |
| 0632 | 0400 | L40 | LDN | 0 | |
| 0633 | 4052 | | STD | WPT | |
| 0634 | 0401 | | LDN | 1 | |
| 0635 | 4003 | | STD | ASFT | |
| 0636 | 2200 | | LDC | 40D | NO CYCLE AFTER 5501 |
| 0637 | 0050 | | | | |
| 0640 | 0277 | | LPN | 77 | |
| 0641 | 0277 | | LPN | 77 | |
| 0642 | 6212 | | PJF | L55 | |
| 0643 | 0400 | L50 | LDN | 0 | |
| 0644 | 4052 | | STD | WPT | |
| 0645 | 0402 | | LDN | 2 | |
| 0646 | 4003 | | STD | ASFT | |
| 0647 | 2200 | | LDC | 40D | NO CYCLE AFTER 5502 |
| 0650 | 0050 | | | | |
| 0651 | 0277 | | LPN | 77 | |
| 0652 | 0277 | | LPN | 77 | |
| 0653 | 6201 | | PJF | L55 | |

26 March 1963

-22-

TM-1003/010/00

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|------|------|-------|-------|-------|----|
| 0654 | 5067 | L55 | HAD | JUNK | |
| 0655 | 2200 | | LDC | 7101 | |
| 0656 | 7101 | | | | |
| 0657 | 4022 | | STD | JUMP3 | |
| 0660 | 2200 | | LDC | TEXT | |
| 0661 | 0705 | | | | |
| 0662 | 0105 | L55.5 | ATE | L55.5 | |
| 0663 | 0662 | | | | |
| 0664 | 0601 | | ADN | 1 | |
| 0665 | 0106 | | ATX | L55.5 | +J |
| 0666 | 0665 | | | | |
| 0667 | 7200 | | ISI | L55.5 | +J |
| 0670 | 0667 | | | | |
| 0671 | 2017 | | LDD | ARE0 | |
| 0672 | 0120 | | CIL | | |
| 0673 | 7020 | | JPI | INT20 | |
| 0674 | 0404 | Y | | 404 | |
| 0675 | 1004 | | | 1004 | |
| 0676 | 0400 | | | 400 | |
| 0677 | 1000 | | | 1000 | |
| 0700 | 0000 | | EXF | | |
| 0701 | 0000 | | INR1 | | |
| 0702 | 0000 | | INR2 | | |
| 0703 | 0000 | | OM1 | | |
| 0704 | 0000 | | OM2 | | |
| 0705 | 0000 | | TEXT | | |
| 0706 | 0000 | | TINB1 | | |
| 0707 | 0000 | | TINB2 | | |
| 0710 | 0000 | | TOH1 | | |
| 0711 | 0000 | | TOH2 | | |
| 0712 | 0400 | | START | | |
| 0713 | 4003 | | LDN | 0 | |
| 0714 | 4004 | | STD | ASFT | |
| 0715 | 4005 | | STD | ASFB | |
| 0716 | 4066 | | STD | TIME | |
| 0717 | 4055 | | STD | TIME | |
| 0720 | 4062 | | STD | TSKIP | |
| 0721 | 0140 | | STD | OSKIP | |
| 0722 | 0401 | | SBU0 | | |
| 0723 | 4006 | | LDN | 1 | |
| 0724 | 4007 | | STD | TCOMP | |
| 0725 | 4013 | | STD | BCOMP | |
| 0726 | 4014 | | STD | LRTS | |
| 0727 | 0403 | | STD | LRS9 | |
| 0730 | 4061 | | LDN | 3 | |
| 0731 | 4054 | | STD | BBR | |
| 0732 | 7500 | | STD | TBR | |
| 0733 | 4702 | | EXC | 4702 | |
| 0734 | 0120 | | | | |
| 0735 | 2200 | | CIL | | |
| 0736 | 7101 | | LDC | 7101 | |
| 0737 | 4022 | | STD | JUMP3 | |
| 0740 | 0400 | | LDN | 0 | |
| 0741 | 6601 | | PJ9 | 1 | |
| | | | MEM | | |
| 0742 | 2005 | TS | LDD | TIME | |
| 0743 | 6003 | | ZJP | 3 | |
| 0744 | 7101 | | JFI | 1 | |
| 0745 | 1045 | | | AD.6 | |
| 0746 | 0401 | | LDN | 1 | |

1 RDY TO REC
2
U NOT RDY REC
2

INITIALIZE

IDLE

TS CYCLE

1ST TIME

26 March 1963

-23-

TM-1003/010/00

| | | | | | |
|------|------|------|------|-------|------------------|
| 0747 | 4005 | | STD | TIME | |
| 0750 | 2003 | | LDD | ASFT | |
| 0751 | 4016 | | STD | SF6 | |
| 0752 | 0701 | | SBN | 1 | |
| 0753 | 6322 | | NJF | A0,2 | |
| 0754 | 6111 | | NZF | A0,1 | |
| 0755 | 2100 | | LDM | TIN91 | COMP 1 |
| 0756 | 0706 | | | | |
| 0757 | 0022 | | SIC2 | | |
| 0760 | 4100 | | STM | OB1 | |
| 0761 | 0703 | | | | |
| 0762 | 0020 | | SIC0 | | |
| 0763 | 7101 | | JFI | 1 | |
| 0764 | 1003 | | | A0,3 | |
| 0765 | 2100 | A0,1 | LDM | TIN92 | COMP 2 |
| 0766 | 0707 | | | | |
| 0767 | 0022 | | SIC2 | | |
| 0770 | 4100 | | STM | OB2 | |
| 0771 | 0704 | | | | |
| 0772 | 0020 | | SIC0 | | |
| 0773 | 7101 | | JFI | 1 | |
| 0774 | 1003 | | | A0,3 | |
| 0775 | 2100 | A0,2 | LDM | INT10 | NEITHER 12 DELAY |
| 0776 | 0010 | | | | |
| 0777 | 4100 | | STM | INT10 | |
| 1000 | 0010 | | | | |
| 1001 | 4010 | | STD | INT10 | |
| 1002 | 4010 | | STD | INT10 | |
| 1003 | 2004 | A0,3 | LDD | ASF0 | |
| 1004 | 4015 | | STD | SFT | |
| 1005 | 0701 | | SBN | 1 | |
| 1006 | 6322 | | NJF | A0,6 | |
| 1007 | 6111 | | NZF | A0,5 | |
| 1010 | 0022 | | SIC2 | | |
| 1011 | 2100 | | LDM | INB1 | COMP 1 |
| 1012 | 0701 | | | | |
| 1013 | 0020 | | SIC0 | | |
| 1014 | 4100 | | STM | TOB1 | |
| 1015 | 0710 | | | | |
| 1016 | 7101 | | JFI | 1 | |
| 1017 | 1037 | | | A0,7 | |
| 1020 | 0022 | A0,5 | SIC2 | | COMP 2 |
| 1021 | 2100 | | LDM | INR2 | |
| 1022 | 0702 | | | | |
| 1023 | 0020 | | SIC0 | | |
| 1024 | 4100 | | STM | TOB2 | |
| 1025 | 0711 | | | | |
| 1026 | 7101 | | JFI | 1 | |
| 1027 | 1037 | | | A0,7 | |
| 1030 | 2100 | A0,6 | LDM | INT10 | NEITHER 12 DELAY |
| 1031 | 0010 | | | | |
| 1032 | 4100 | | STM | INT10 | |
| 1033 | 0010 | | | | |
| 1034 | 2020 | | LDD | INT10 | |
| 1035 | 4004 | | STD | ASF0 | |
| 1036 | 4003 | | STD | ASF1 | |
| 1037 | 0400 | A0,7 | LDM | 0 | |
| 1040 | 4010 | | STD | INT10 | |
| 1041 | 2013 | | LDD | LRTS | COMP=OPPOS LRTS |
| 1042 | 0301 | | SCN | 1 | |

26 March 1963

-24-

TM-1003/010/00

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|------|------|-------|-----|--------|----------------|
| 1043 | 4006 | | STD | TCOMP | |
| 1044 | 6215 | | PJF | A1 | |
| 1045 | 0400 | A0,8 | LDN | 0 | DELAY 42 TOTAL |
| 1046 | 4005 | | STD | TIME | |
| 1047 | 0503 | | LCN | 3 | |
| 1050 | 4067 | | STD | JUNK | |
| 1051 | 2100 | A0,9 | LDM | INT10 | |
| 1052 | 0010 | | | | |
| 1053 | 4100 | | STM | INT10 | |
| 1054 | 0010 | | | | |
| 1055 | 0501 | | LCN | 1 | |
| 1056 | 5467 | | AOD | JUNK | |
| 1057 | 6706 | | NJB | A0,9 | |
| 1060 | 2010 | | LDD | INT10 | |
| 1061 | 0401 | A1 | LDN | 1 | |
| 1062 | 4050 | | STD | THSTAT | |
| 1063 | 4051 | | STD | WST | |
| 1064 | 4052 | | STD | WPT | |
| 1065 | 4071 | | STD | TRAK | |
| 1066 | 2006 | A10 | LDD | TCOMP | |
| 1067 | 6154 | | NZF | A25 | IF COMP 2 |
| 1070 | 2054 | | LDD | TSR | COMP 1 |
| 1071 | 0201 | | LPA | 1 | |
| 1072 | 6034 | | ZJF | A11 | |
| 1073 | 2055 | | LDD | TSKIP | |
| 1074 | 6134 | | NZF | A11 | +2 |
| 1075 | 2100 | | LDM | INT10 | DELAY 7 |
| 1076 | 0010 | | | | |
| 1077 | 4100 | | STM | INT10 | |
| 1100 | 0010 | | | | |
| 1101 | 2100 | | LDM | T | |
| 1102 | 0674 | | | | |
| 1103 | 4065 | | STD | STATT | |
| 1104 | 2015 | | LDD | SFT | |
| 1105 | 0201 | | LPA | 1 | |
| 1106 | 6011 | | ZJF | A20 | |
| 1107 | 0400 | A19 | LDN | 0 | |
| 1110 | 4015 | | STD | SFT | |
| 1111 | 2065 | | LDD | STATT | |
| 1112 | 0601 | | ADN | 1 | |
| 1113 | 4065 | | STD | STATT | |
| 1114 | 0401 | | LDN | 1 | |
| 1115 | 4053 | A19,9 | STD | TSRDY | |
| 1116 | 6253 | | PJF | A39,9 | +1 |
| 1117 | 0400 | A20 | LDN | 0 | DELAY 11 |
| 1120 | 4100 | | STM | INT10 | |
| 1121 | 0010 | | | | |
| 1122 | 4100 | | STM | INT10 | |
| 1123 | 0010 | | | | |
| 1124 | 0400 | | LDN | 0 | |
| 1125 | 6610 | | PJB | A19,9 | |
| 1126 | 2100 | A11 | LDM | INT10 | |
| 1127 | 0010 | | | | |
| 1130 | 0400 | | LDN | 0 | |
| 1131 | 4055 | | STD | TSKIP | |
| 1132 | 2100 | | LDM | T | +2 |
| 1133 | 0676 | | | | |
| 1134 | 4100 | | STM | STATT | |
| 1135 | 0065 | | | | |

26 March 1963

-25-

TM-1003/010/00

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|------|------|-------|-----|-------|--------------|
| 1136 | 2015 | | LDD | SFT | |
| 1137 | 0201 | | LPA | 1 | |
| 1140 | 6531 | | NZB | A19 | |
| 1141 | 7101 | | JFI | 1 | |
| 1142 | 1313 | | | A99 | |
| 1143 | 2054 | A25 | LDD | TSR | |
| 1144 | 0202 | | LPA | 2 | |
| 1145 | 6034 | | ZJF | A31 | |
| 1146 | 2055 | | LDD | TSKIP | |
| 1147 | 6134 | | NZF | A31 | +2 |
| 1150 | 2100 | | LDM | INT10 | DELAY 7 |
| 1151 | 0010 | | | | |
| 1152 | 4100 | | STM | INT10 | |
| 1153 | 0010 | | | | |
| 1154 | 2100 | | LDM | T | +1 |
| 1155 | 0675 | | | | |
| 1156 | 4065 | | STD | STAT | |
| 1157 | 2015 | | LDD | SFT | |
| 1160 | 0202 | | LPA | 2 | |
| 1161 | 6011 | | ZJF | A40 | |
| 1162 | 0400 | A39 | LDN | 0 | |
| 1163 | 4015 | | STD | SFT | |
| 1164 | 2065 | | LDD | STAT | |
| 1165 | 0601 | | ADN | 1 | |
| 1166 | 4065 | | STD | STAT | |
| 1167 | 0401 | | LDN | 1 | |
| 1170 | 4053 | A39.9 | STD | TSRDY | |
| 1171 | 6225 | | PJF | A50 | |
| 1172 | 0400 | A40 | LDN | 0 | DELAY 11 |
| 1173 | 4100 | | STM | INT10 | |
| 1174 | 0010 | | | | |
| 1175 | 4100 | | STM | INT10 | |
| 1176 | 0010 | | | | |
| 1177 | 0400 | | LDN | 0 | |
| 1200 | 6610 | | PJW | A39.9 | |
| 1201 | 2100 | A31 | LDM | INT10 | |
| 1202 | 0010 | | | | |
| 1203 | 0400 | | LDN | 0 | |
| 1204 | 4055 | | STD | TSKIP | |
| 1205 | 2100 | | LDM | T | +3 |
| 1206 | 0677 | | | | |
| 1207 | 4100 | | STM | STAT | |
| 1210 | 0065 | | | | |
| 1211 | 2015 | | LDD | SFT | |
| 1212 | 0202 | | LPA | 2 | |
| 1213 | 6531 | | NZB | A39 | |
| 1214 | 7101 | | JFI | 1 | |
| 1215 | 1313 | | | A99 | |
| 1216 | 7500 | A50 | EXC | 10 | INTERRUPT TS |
| 1217 | 0010 | | | | |
| 1220 | 0120 | | CIL | | |
| 1221 | 2600 | | LCC | 2900 | |
| 1222 | 0442 | | | | |
| 1223 | 4067 | | STD | JUNK | |
| 1224 | 0405 | | LDN | 5 | |
| 1225 | 5067 | | NAD | JUNK | |
| 1226 | 6702 | | NJB | 2 | |
| 1227 | 0400 | | LDN | 0 | |
| 1230 | 4071 | | STD | TRAK | |
| 1231 | 0562 | | LCN | 50D | |

26 March 1963

-26-

TM-1003/010/00

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|------|------|-------|------|--------|----|
| 1232 | 5067 | | MAD | JUNK | |
| 1233 | 6204 | | PJF | 4 | |
| 1234 | 0405 | | LDA | 5 | |
| 1235 | 5067 | | MAD | JUNK | |
| 1236 | 6702 | | NJH | 2 | |
| 1237 | 2050 | | LDD | TRSTAT | |
| 1240 | 4130 | | NZF | A90 | |
| 1241 | 2053 | | LDD | TSRDY | |
| 1242 | 6016 | | ZJF | A85 | |
| 1243 | 2051 | | LDD | WST | |
| 1244 | 6127 | | NZF | A91 | |
| 1245 | 2052 | A80 | LDD | WPT | |
| 1246 | 6114 | | NZF | A87 | |
| 1247 | 0401 | | LDA | 1 | |
| 1250 | 4055 | | STD | TSKIP | |
| 1251 | 2006 | | LDD | TCOMP | |
| 1252 | 4013 | | STD | LRTS | |
| | | | | | |
| 1253 | 2006 | A80 | LDD | TCOMP | |
| 1254 | 0301 | | SCN | 1 | |
| 1255 | 4006 | | STD | TCOMP | |
| 1256 | 7101 | | JFI | 1 | |
| 1257 | 1323 | | | 88 | |
| 1260 | 2051 | A85 | LDD | WST | |
| 1261 | 6614 | | PJF | A80 | |
| 1262 | 2100 | A87 | LDM | INT10 | |
| 1263 | 0010 | | | | |
| 1264 | 4100 | | STM | INT10 | |
| 1265 | 0010 | | | | |
| 1266 | 7101 | | JFI | 1 | |
| 1267 | 1253 | | | A80 | |
| 1270 | 7701 | A90 | SLS1 | | |
| 1271 | 7101 | | JFI | 1 | |
| 1272 | 1274 | | | A91 | +1 |
| 1273 | 7702 | A91 | SLS2 | | |
| 1274 | 7500 | | EXC | 30 | |
| 1275 | 0030 | | | | |
| 1276 | 0120 | | GIL | | |
| 1277 | 0104 | | CBC | | |
| 1300 | 2200 | | LDC | TEXF | |
| 1301 | 0705 | | | | |
| 1302 | 0105 | A91,1 | ATE | A91,1 | |
| 1303 | 1302 | | | | |
| 1304 | 0601 | | ADA | 1 | |
| 1305 | 0106 | A91,2 | ATX | A91,2 | |
| 1306 | 1305 | | | | |
| 1307 | 7200 | A91,3 | IBI | A91,3 | |
| 1310 | 1307 | | | | |
| 1311 | 7101 | | JFI | 1 | |
| 1312 | 1253 | | | A80 | |
| 1313 | 2600 | A99 | LCC | 4250 | |
| 1314 | 0651 | | | | |
| 1315 | 4067 | | STD | JUNK | |
| 1316 | 0405 | | LDA | 5 | |
| 1317 | 5067 | | MAD | JUNK | |
| 1320 | 6702 | | NJH | 2 | |
| 1321 | 7101 | | JFI | 1 | |
| 1322 | 1253 | | | A80 | |
| | | | | | |
| 1323 | 2066 | 88 | REM | | |
| | | | LDD | TIM4 | |

WAS ABLE SEND

WORD REC

DELAY 3

DELAY 9

BIRD CYCLE

26 March 1963

-27-

TM-1003/010/00

| | | | | | |
|------|------|-------|------|--------|-----------|
| 1324 | 6106 | | NZF | B01 | |
| 1325 | 0401 | | LDA | 1 | |
| 1326 | 4100 | | STM | TIM2 | |
| 1327 | 0006 | | | | |
| 1330 | 7101 | | JFI | 1 | |
| 1331 | 1340 | | | B-H | |
| 1332 | 0400 | B01 | LDA | | |
| 1333 | 4006 | | STD | TIM2 | |
| 1334 | 0400 | | LDA | | DELAY |
| 1335 | 4100 | | STM | INT10 | |
| 1336 | 0010 | | | | |
| 1337 | 6204 | | PJF | B00 | +3 |
| 1340 | 2014 | B02 | LDD | LRR2 | |
| 1341 | 0301 | | SCA | 1 | |
| 1342 | 4007 | | STD | BCCMP | |
| 1343 | 0401 | | LDA | 1 | |
| 1344 | 4006 | | STD | BHSTAT | |
| 1345 | 4057 | | STD | WSE | |
| 1346 | 4060 | | STD | WPH | |
| 1347 | 4070 | | STD | WIRD | |
| 1350 | 2007 | | LDD | BCCMP | |
| 1351 | 6163 | | NZF | B25 | IF COMP 2 |
| 1352 | 2061 | | LDD | B0R | |
| 1353 | 0201 | | LPA | 1 | |
| 1354 | 6042 | | ZJF | B11 | |
| 1355 | 2062 | | LDD | BSKIP | |
| 1356 | 6142 | | NZF | B11 | +2 |
| 1357 | 2100 | | LDM | INT10 | DELAY 7 |
| 1360 | 0010 | | | | |
| 1361 | 4100 | | STM | INT10 | |
| 1362 | 0010 | | | | |
| 1363 | 2100 | | LDM | T | |
| 1364 | 0674 | | | | |
| 1365 | 0042 | | SDC2 | | |
| 1366 | 4064 | | STD | STATM | |
| 1367 | 0040 | | SDC0 | | |
| 1370 | 2016 | | LDD | SF0 | |
| 1371 | 0201 | | LPA | 1 | |
| 1372 | 6014 | | ZJF | B20 | |
| 1373 | 0400 | B19 | LDA | 0 | |
| 1374 | 4016 | | STD | SF0 | |
| 1375 | 0042 | | SDC2 | | |
| 1376 | 2064 | | LDD | STATM | |
| 1377 | 0601 | | ADA | 1 | |
| 1400 | 4064 | | STD | STATM | |
| 1401 | 0040 | | SDC0 | | |
| 1402 | 0401 | | LDA | 1 | |
| 1403 | 4063 | B19,9 | STD | BHBDY | |
| 1404 | 7101 | | JFI | 1 | |
| 1405 | 1515 | | | B30 | |
| 1406 | 0400 | B20 | LDA | 0 | DELAY 13 |
| 1407 | 4100 | | STM | INT10 | |
| 1410 | 0010 | | | | |
| 1411 | 4100 | | STM | INT10 | |
| 1412 | 0010 | | | | |
| 1413 | 4010 | | STD | INT10 | |
| 1414 | 0400 | | LDA | 0 | |
| 1415 | 6612 | | PJ0 | B19,9 | |
| 1416 | 2100 | B11 | LDM | INT10 | |
| 1417 | 0010 | | | | |

26 March 1963

-28-

TM-1003/010/00

| | | | | | |
|------|------|-------|------|-------|----------|
| 1420 | 0400 | | LDA | 0 | |
| 1421 | 4062 | | STD | MSKIP | |
| 1422 | 2100 | | LDM | T | +2 |
| 1423 | 0676 | | | | |
| 1424 | 0042 | | SDC2 | | |
| 1425 | 4064 | | STD | STATB | |
| 1426 | 0040 | | SDC3 | | |
| 1427 | 2016 | | LDD | SFB | |
| 1430 | 0201 | | LPA | 1 | |
| 1431 | 6536 | | NZW | W19 | |
| 1432 | 7101 | | JFI | 1 | |
| 1433 | 1602 | | | 099 | |
| 1434 | 2061 | W25 | LDD | 00R | |
| 1435 | 0202 | | LPA | 2 | |
| 1436 | 6040 | | ZJF | 031 | |
| 1437 | 2062 | | LDD | MSKIP | |
| 1440 | 6140 | | NZF | 031 | +2 |
| 1441 | 2100 | | LDM | INT10 | |
| 1442 | 0010 | | | | DELAY 7 |
| 1443 | 4100 | | STM | INT10 | |
| 1444 | 0010 | | | | |
| 1445 | 2100 | | LDM | T | +1 |
| 1446 | 0675 | | | | |
| 1447 | 0042 | | SDC2 | | |
| 1450 | 4064 | | STD | STATB | |
| 1451 | 0040 | | SDC3 | | |
| 1452 | 2016 | | LDD | SFB | |
| 1453 | 0202 | | LPA | 2 | |
| 1454 | 6013 | | ZJF | W40 | |
| 1455 | 0400 | W39 | LDA | 0 | |
| 1456 | 4016 | | STD | SFB | |
| 1457 | 0042 | | SDC2 | | |
| 1460 | 2064 | | LDD | STATB | |
| 1461 | 0601 | | ADN | 1 | |
| 1462 | 4064 | | STD | STATB | |
| 1463 | 0040 | | SDC3 | | |
| 1464 | 0401 | | LDA | 1 | |
| 1465 | 4063 | W39.9 | STD | W3RDY | |
| 1466 | 6227 | | PJF | W50 | |
| 1467 | 0400 | W40 | LDA | 0 | |
| 1470 | 4100 | | STM | INT10 | |
| 1471 | 0010 | | | | DELAY 13 |
| 1472 | 4100 | | STM | INT10 | |
| 1473 | 0010 | | | | |
| 1474 | 4010 | | STD | INT10 | |
| 1475 | 6610 | | PJW | W39.9 | |
| 1476 | 2100 | W31 | LDM | INT10 | |
| 1477 | 0010 | | | | |
| 1500 | 0400 | | LDA | 0 | |
| 1501 | 4062 | | STD | MSKIP | |
| 1502 | 2100 | | LDM | T | +3 |
| 1503 | 0677 | | | | |
| 1504 | 0022 | | SIC2 | | |
| 1505 | 4100 | | STM | STATB | |
| 1506 | 0064 | | | | |
| 1507 | 0020 | | SIC0 | | |
| 1510 | 2016 | | LDD | SFB | |
| 1511 | 0202 | | LPA | 2 | |
| 1512 | 6535 | | NZW | W39 | |
| 1513 | 7101 | | JFI | 1 | |

26 March 1963

-29-

TM-1003/010/00

| | | | | | |
|------|------|-----|------|--------|---------------|
| 1514 | 1602 | | | 899 | |
| 1515 | 7500 | 850 | EXC | 20 | INTERRUPT 48 |
| 1516 | 0020 | | | | |
| 1517 | 0120 | | CIL | | |
| 1520 | 2600 | | LCC | 3150 | |
| 1521 | 0473 | | | | |
| 1522 | 4067 | | STD | JUNK | |
| 1523 | 0405 | | LDA | 5 | |
| 1524 | 5067 | | HAD | JUNK | |
| 1525 | 6702 | | NJB | 2 | |
| 1526 | 0400 | | LDA | 0 | |
| 1527 | 4070 | | STD | DIRN | |
| 1530 | 0562 | | LCA | 500 | |
| 1531 | 5067 | | HAD | JUNK | |
| 1532 | 6204 | | PJF | 4 | |
| 1533 | 0405 | | LDA | 5 | |
| 1534 | 5067 | | HAD | JUNK | |
| 1535 | 6702 | | NJB | 2 | |
| 1536 | 2056 | | LDD | 8857AT | |
| 1537 | 6130 | | NZF | 890 | |
| 1540 | 2063 | | LDD | 8880Y | |
| 1541 | 6016 | | ZJF | 885 | |
| 1542 | 2057 | | LDD | WSB | WAS ABLE SEND |
| 1543 | 6127 | | NZF | 891 | |
| 1544 | 2060 | 860 | LDD | WPS | |
| 1545 | 6114 | | NZF | 887 | |
| 1546 | 0401 | | LDA | 1 | WORD REC |
| 1547 | 4062 | | STD | BSKIP | |
| 1550 | 2007 | | LDD | BCOMP | |
| 1551 | 4014 | | STC | LR88 | |
| 1552 | 2007 | 860 | LDD | BCOMP | |
| 1553 | 0301 | | SCN | 1 | |
| 1554 | 4007 | | STC | BCOMP | |
| 1555 | 7101 | | JFI | 1 | |
| 1556 | 0742 | | | TS | |
| 1557 | 2057 | 485 | LDC | WSB | DELAY 3 |
| 1560 | 6614 | | PJB | 860 | |
| 1561 | 2100 | 887 | LDM | INT10 | DELAY 9 |
| 1562 | 0010 | | | | |
| 1563 | 4100 | | STM | INT10 | |
| 1564 | 0010 | | | | |
| 1565 | 7101 | | JFI | 1 | |
| 1566 | 1552 | | | 880 | |
| 1567 | 7701 | 890 | SLS1 | | |
| 1570 | 7101 | | JFI | 1 | |
| 1571 | 1573 | | | 891 | 41 |
| 1572 | 7702 | 891 | SLS2 | | |
| 1573 | 7500 | | EXC | 30 | |
| 1574 | 0030 | | | | |
| 1575 | 7500 | | EXC | 4702 | |
| 1576 | 4702 | | | | |
| 1577 | 0120 | | CIL | | |
| 1600 | 7101 | | JFI | 1 | |
| 1601 | 1552 | | | 880 | |
| 1602 | 2600 | 899 | LCC | 4030 | |
| 1603 | 0717 | | | | |
| 1604 | 4067 | | STL | JUNK | |
| 1605 | 0405 | | LDA | 5 | |
| 1606 | 5067 | | HAD | JUNK | |
| 1607 | 4702 | | NJB | 2 | |

26 March 1963

-30-
(last page)

TM-1003/010/00

| | | | | |
|------|------|-------|-----|-------|
| 1610 | 0400 | | LDA | 0 |
| 1611 | 7101 | | JFI | 1 |
| 1612 | 1552 | | | 880 |
| 1613 | 2200 | UPRUF | LDC | TEXP |
| 1614 | 0705 | | | |
| 1615 | 0105 | A00,1 | ATE | A00,1 |
| 1616 | 1615 | | | |
| 1617 | 0601 | | ADN | 1 |
| 1620 | 0106 | A00,2 | ATX | A00,2 |
| 1621 | 1620 | | | |
| 1622 | 7200 | A00,3 | ISI | A00,3 |
| 1623 | 1622 | | | |
| 1624 | 7101 | | JFI | 1 |
| 1625 | 0742 | | | TS |
| | 0000 | | END | |

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DESCRIPTION.
Scientific rept., TM-1003/010/00,
by V. J. Gergen. 26 March 1963, 30p.
(Contract AF 19(628)-1648, Space Systems
Division Program, for Space Systems
Division, AFSC)

Unclassified report

DESCRIPTORS: Programming (Computers).
Satellite Networks.

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Reports that the CCC Simulator provides
a simulated intercommunication link
between the Bird Buffer (BB) computer
and the Tracking Station (TS) computer
that is normally performed by the
Computer Communication Converter (CCC)
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